

(19)



(11)

EP 2 240 362 B1

(12)

EUROPEAN PATENT SPECIFICATION

(45) Date of publication and mention
of the grant of the patent:
01.08.2012 Bulletin 2012/31

(21) Application number: **08857856.2**

(22) Date of filing: **03.12.2008**

(51) Int Cl.:
B63B 27/24 (2006.01)

(86) International application number:
PCT/EP2008/066667

(87) International publication number:
WO 2009/071563 (11.06.2009 Gazette 2009/24)

(54) HYDROCARBON TRANSFER SYSTEM WITH A PIVOTAL BOOM

System zur Kohlenwasserstoffübertragung mit einem schwenkbaren Ausleger

SYSTÈME DE TRANSFERT DU GAZ NATUREL À BRAS PIVOTANT

(84) Designated Contracting States:
**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HR HU IE IS IT LI LT LU LV MC MT NL NO PL PT
RO SE SI SK TR**

(30) Priority: **03.12.2007 EP 07122140**

(43) Date of publication of application:
20.10.2010 Bulletin 2010/42

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Description

[0001] The invention relates to a hydrocarbon transfer system comprising an offshore structure with a support member extending upward from deck level of the structure, a hydrocarbon transfer duct comprising a transfer duct section extending from a free end of the support member, which free end is located outboard of the structure, to a hydrocarbon storage and/or processing unit on the structure and a connecting duct section in fluid communication with the transfer duct section and connected with a first end to the free end of the support member, a second end of the connecting duct section having a connector and being attachable to a hydrocarbon structure.

[0002] Liquefied Natural Gas (LNG) may be produced at seabed-supported platforms or spread moored or turret moored LNG liquefaction barges (FLNG) and is transferred from the production/processing site to cryogenic carriers. The LNG carriers may be vessels that are moored to an offshore liquefaction barge in a tandem configuration, via hawsers connecting the bow of the LNG carrier to the stem of the liquefaction barge and that are kept in position by dynamic positioning and the use of their thrusters. A flexible cryogenic hose connects at one end to a manifold at the bow of the carrier and at another end to a crane boom on the barge.

[0003] In US patent no. 6,434,948 a LNG transfer system is described in which a flexible LNG pipe is arranged at the end of a crane or boom which crane is rotatable around a horizontal axis. A connector in the LNG tank vessel's bow is connected to a pipe manifold leading further to the LNG tanks on the vessel. The crane, which may be an A-frame crane, supports the flexible hose from rigid pipe swivel ducts and gives the flexible LNG pipe in its lowest point sufficient clearance above the sea to avoid being hit by waves. Also, the movable crane frame compensates for slow changes in draught during the LNG transfer. The known crane has a relatively large footprint on the LNG barge when the crane is pivoted inboard of the vessel and the flexible hose is stored on deck. In order to raise the cryogenic hose above sea level when it is disconnected from the LNG tanker, the known crane must pivot around the horizontal axis. The drive mechanism for the crane is relatively complex and large in order to drive the large boom, and raising the cryogenic hose is therefore relatively slow. In case of an emergency quick disconnect procedure, the known crane may not be able to raise the cryogenic hose in a sufficiently rapid manner. Furthermore, in its retracted position, the crane extends above deck level of the LNG barge and has a relatively large footprint, occupying an area in which no further activities can be carried out.

[0004] It is an object of the present invention to provide a hydrocarbon transfer system for an offshore structure in which a hydrocarbon duct can be easily and rapidly connected to a tanker vessel. It is a further object to provide a hydrocarbon transfer system which maintains a safe clearance of the transfer duct above sea level in the

disconnected state and which has a relatively small footprint on the structure. It is again an object to provide a hydrocarbon transfer system which is easy to operate and which can be rapidly connected and disconnected in a safe manner. It is another object to provide a hydrocarbon transfer system which allows rapid and space-efficient storage of the disconnected hydrocarbon transfer duct on the structure.

[0005] Hereto a hydrocarbon transfer system in accordance with the present invention is characterised in that the support member comprises a displacement device, connected to the first end of the connecting duct section, which displacement device is movable between a connect and a disconnect position while the support member remains substantially stationary, a vertical distance from deck level of the displacement device being larger for the disconnect position than for the connect position, a horizontal distance from the side of the structure being larger for the connect position than for the disconnect position. In the disconnect position, the connecting duct section in its vertical orientation is situated with its connector at a predetermined distance above sea level.

[0006] By providing a displacement device at the top end of the connecting duct section, the connecting duct section may while it is vertically depending from the support structure, be raised relatively high above seal level by movement of the displacement device only, such as at for instance a distance of between 1m and 15m, preferably about 5m. The support structure, which may comprise a crane or boom, remains substantially stationary. The vertically supported connecting duct section, which preferably comprises a flexible cryogenic transfer hose, may next be connected to a manifold of a tanker vessel, by pulling in a cable connected to the free end of the duct section, via a winch on the tanker vessel. The connecting duct section thereby assumes a more horizontal position and the displacement device may be moved towards the tanker vessel to provide additional length of the transfer duct section bridging the distance between the tanker vessel and the structure. In this way, clearance of the connecting duct section above seal level can, in case of a quick release of the duct from the tanker vessel, be achieved rapidly via the displacement member while only driving the relatively small displacement member, which can be effected rapidly with a relatively simple and light drive member. As the support structure can remain stationary, the footprint of the support structure on the offshore structure can be small.

[0007] The connecting duct section is preferably formed by a flexible hose, such as a cryogenic transfer hose that is described in US patent no. 4,445,543, which assumes a curved configuration when connected to the tanker vessel. The offshore structure carrying the support member may rest on the sea bed and may comprise a column-supported platform. The offshore structure can also be a floating structure such as a semi-submersible structure or a turret or spread moored barge.

[0008] In one embodiment, the displacement device comprises an arm which is with a base end hingingly connected to the free end of the support member, a support end of the arm carrying the connecting duct section, a force member being connected to the arm for pivoting the arm between a substantially vertical disconnect position and a substantially horizontal connect position. Via the arm, the connecting duct section can be displaced along a circular trajectory from the disconnect position in which the arm extends in a generally vertical direction, to a connect position in which the arm extends in a generally horizontal direction. The force member can be formed by one or more hydraulic cylinders connected on one side to the support structure and on the other side to the arm of the displacement device. Actuation of the cylinders may be controlled by a computerised connect-release system with an emergency actuation to raise the displacement member in case of quick release of the connectors.

[0009] The support member may comprise a frame that extends at an angle, a support surface being situated along at least a part of the length of the support member. The connecting duct section can be placed on the support surface to extend along the support member in the disconnected state. In the storage position, the connecting duct can remain attached to the transfer duct that is connected to a hydrocarbon storage and/or processing unit on the LNG barge. The transfer duct section may comprise a rigid duct which is attached at the free end of the support member to a displacement duct via a fluid swivel rotatable around a horizontal axis, a second end of the displacement duct being connected to the connecting duct section via a second swivel rotatable around a horizontal axis.

[0010] In one embodiment, the displacement device is in its lowest and most forward position - the connect position- while the connecting duct section is situated on the support surface. By raising the displacement device to the disconnect position, the connecting duct section is lifted from the support surface to become vertically oriented and depend from the raised displacement device.

[0011] An embodiment of a cryogenic LNG transfer system according to the present invention will by way of example be described in detail with reference to the accompanying drawings. In the drawings:

Fig. 1 shows a side view of an LNG barge being moored with its stem to the bow of an LNG carrier, and connected to the carrier via a flexible cryogenic hose with the displacement device in the connect position,

Figs. 2a and 2b show an enlarged detail of a hammerhead manifold at the bow of the LNG tanker, coupled to the connector of the flexible cryogenic hose, and the displacement device, respectively,

Fig. 3 shows a side view of the LNG barge and LNG carrier of Fig. 1 while the flexible hose is disconnect-

ed, and raised above sea level via the displacement device,

Fig. 4 shows an enlarged detail of the displacement device in the disconnect position,

Figs. 5a and 5b show an enlarged detail of the lower end and the upper end of the cryogenic hose respectively while extending on a support surface along the support member on the LNG barge,

Fig. 6 shows another view of the displacement device in the disconnect position while the flexible hose extends along the support member, and

Figs. 7 and 8 show different stages of the connection process of the flexible hose.

[0012] Fig. 1 shows a hydrocarbon transfer system comprising an offshore structure in the form of a floating LNG liquefaction barge 1. The barge 1 is at its stem 2 provided with a support frame 3 extending upward from deck level 11 at an angle α of about 45° , outboard from the barge 1. A LNG carrier 4 is moored with its bow 5 to the stem 2 via hawsers 6, 7. Instead of, or in addition to the hawsers 6, 7, the carrier may be moored, i.e. kept of at a defined position, by one of its thrusters, so called dynamic positioning. For applications where the carrier is equipped with dynamic positioning (DP) the hawsers 6, 7 are installed as a backup safety mooring system which maintains the carrier 4 close to the LNG barge in case of failure of the DP system of the carrier. A connecting duct section in the form of a flexible cryogenic hose 8 is with its upper end 9 attached to a displacement device 10. A lower connector end 12 of the hose 8 carries a connector 13 which is attached to a manifold 15 on the carrier 4. The manifold 15 comprises a plurality of connectors, such as a connector 17 for a liquid LNG line, a connector 18 for a hybrid line and a connector 19 for a vapour return line, such as shown in fig. 2a. The connector 13 and each complementary connector 17-19 are provided with a quick connect/disconnect system (QC/DC), an emergency release system (ERS) and a Break Away Connector System (BAC). On the hammerhead bow structure, the manifold 15 is supported on a hinged articulation, such that it can be rotated to be in line with the hose 8.

[0013] In fig. 1 it can be seen that a second flexible hose 20 is with an upper end connected to a respective displacement device for the hose 20. The hose rests on a support surface 25 on the support frame 3, such that the lower end 21, at which the connector 23 is provided, is situated near a lower part of the support frame 3 near deck level 11 of the barge 1. In this way, the hose 20 can be moved between a connect position and a storage position while minimising hose fatigue and reducing the footprint of the hose on the deck of the barge 1. Stairs are provided on the support structure 3 to allow access to the hose 20 for inspection, testing, repair and maintenance.

[0014] Along the support frame 3, a rigid cryogenic transfer duct 27 is provided that extends to a LNG storage

or processing unit 28, such as a cryogenic tank, on the barge 1. At its upper end 29, the transfer duct 27 is connected to a displacement duct 30 that interconnects the rigid transfer duct 27 and the flexible connecting duct 8 via swivels 38, 39. The displacement duct 30 extends along the displacement device 10, as shown in fig. 2b. The displacement device 10 comprises a frame 33 which is with a base end 36 connected to the free end 35 of the support structure 3, via a pivot joint 34. The free end 35 of the frame 33 carries the flexible hose 8, which is via the swivel 39 connected to the displacement duct 30 which is attached to the frame 33 and which can pivot together with the frame from the horizontal connect position, as shown in fig. 1, to a vertical disconnect position as shown in fig. 3.

[0015] In the connect position such as shown in fig. 1, the height H_3 of the displacement device 10 above deck level 11 can be for instance about 40m. The distance D_1 of the upper end 9 of the connecting duct 8 from the side of the barge 1 is for instance 50 m.

[0016] In the disconnect position that is shown in figure 3, the frame 33 of the displacement device 10 is placed in the vertically upright opposition such that the free end 35 is raised by a height H_2 of about 10 m and the connector 13 at the end of the flexible hose 8, comprising the complex QC/DC, ERS and BAC components, is positioned well above sea level by a height H_1 of for instance about 3-7 m. The distance H_4 above deck level 11 is for instance about 50 m and the distance D_2 of the vertical hose 8 from the side of the barge 1 is for instance 40 m.

[0017] As can be seen from fig. 4, several flexible hoses 8', 8'' are supported along the support frame 3, with their respective displacement devices 10', 10'' in a horizontal position. The hoses 8', 8'' are supported on a surface on the support frame 3 and are accessible for inspection, maintenance or repair via stairs 40. The connector ends 12', 12'' of the hoses 8', 8'' are supported on a substantially horizontal platform 42 and are fixed in place by U-shaped brackets 43, which may be provided with a clamping device.

[0018] Fig. 5b shows the displacement device 10 of the flexible hose 8 in the vertical position, while the hose is supported along the support frame 3. In this position of the hose 8, the U-shaped brackets 43 on the lower platform 42 may be opened and the hose 8 may be pushed from the support surface by personnel, such that the hose 8 becomes vertically oriented, depending from the displacement device 10. The frame 33 of the displacement device 10 can be seen to comprise a transverse reinforcing member 45 for carrying the weight of the flexible duct 8.

[0019] Fig. 6 shows the displacement 10 from the stern looking towards the bow of the barge 1. At the suspension end, the flexible duct is connected to a hinge articulation integrated in the boom extremity 46 which is adapted for suspending the flexible duct from the frame 33 and which interconnects the duct in a fluid transport manner to the displacement duct 30 via the cryogenic swivel 39. A force

member 41 is provided, such as for instance one or more hydraulic cylinders, for pivoting the frame 33 around the pivot joint 34 from a horizontal connect position to a vertical disconnect position. The force member 41 may be driven by an emergency control system for rapidly raising the frame 33 upon occurrence of an emergency in order to keep the connector end 12 clear from the water at all times upon quick release or break away of the connector 13.

[0020] Fig. 7 shows the flexible hose 8 being connected via a cable 50 at its connector end 13 to a winch 51 on the bow of the vessel. The connector end 12 of the hose 8 is pulled towards the vessel 5 until the connector 13 is in line with the connectors 17-19 of the manifold 15 on the bow of the vessel 5. When the connector 13 is aligned with the manifold, the displacement device 10 is lowered as shown in figure 8, and the connector 13 on the flexible hose 8 is pulled inboard of vessel 5 via the winch 51 and is connected to the manifold. In case of a required quick release, the connector 13 can be disengaged while the displacement device 10 is quickly uprighted so that the connector 13 at the free end of the hose 8 remains well above water level.

Claims

1. Hydrocarbon transfer system comprising an offshore structure (1), a support member (3,10) extending upward from deck level (11) of the structure, a hydrocarbon transfer duct comprising a transfer (27) duct section extending from a free end (29) of the support member (3), which free end is located outboard of the structure (1), to a hydrocarbon storage and/or processing unit (28) on the structure and a connecting duct section (8) in fluid communication with the transfer duct section (27) and connected with a first end (9) to the free end of the support member, a second end (12) of the connecting duct section (8) having a connector (13) and being attachable to a hydrocarbon vessel (4), the support member comprises a substantially stationary support frame (3) extending outboard from the structure (1) and a displacement device (10), connected to the first end (9) of the connecting duct section (8), which displacement device is movable between a connect and a disconnect position while the support frame (3) remains substantially stationary, the displacement device (10) comprising an arm which is with a base end (36) hingingly connected to the support frame (3), a support end (35) of the arm carrying the connecting duct section (8), a force member (41) being connected to the arm for pivoting the arm between a disconnect position and a substantially horizontal connect position, a horizontal distance from the side of the structure being larger for the connect position (D_1) than for the disconnect position (D_2), **characterised in that**, the disconnect position is substantially

vertical and a vertical distance from deck level (11) of the displacement device being larger for the disconnect position (H4) than for the connect position (H3).

2. Hydrocarbon transfer structure according to claim 1, wherein the support member (3) extends at an angle (α), a support surface (25, 42) being situated along at least a part of the length of the support member, the connecting duct section (8) being placable on the support surface (25,42) to extend along the support member. 5
3. Hydrocarbon transfer system according to claim 2, wherein the displacement device (10) is in the connect position when the connecting duct section (8) is situated on the support surface (25,42). 10
4. Hydrocarbon transfer system according to any of claims 1-3, the connecting duct section (8) comprising a flexible hose. 15
5. Hydrocarbon transfer system according to any of the preceding claims, wherein the transfer duct section (27) comprises a rigid duct which is attached at the free end (29) of the support frame (3) to a displacement duct (30) via a fluid swivel (38) rotatable around a horizontal axis, a second end of the displacement duct being connected to the connecting duct section (8) via a second swivel (39) rotatable around a horizontal axis. 20
6. Hydrocarbon transfer system according to claim 5, wherein the displacement duct (30) is a rigid duct. 25
7. Hydrocarbon transfer system according to any of the preceding claims, the transfer structure comprising a floating hydrocarbon vessel, the support member (3) being situated at a stem (2) of the vessel, a second hydrocarbon vessel (4) being connected with its bow (5) to the stem (2) of the hydrocarbon vessel via at least one mooring line. 30
8. Method of transferring hydrocarbons from a hydrocarbon structure to a hydrocarbon vessel, comprising the steps of: 35
 - mooring the hydrocarbon vessel in the vicinity of the hydrocarbon structure,
 - supporting a connecting duct section in a generally vertical orientation from a displacement device (10) at the free end of a substantially stationary support frame (3) on the first hydrocarbon structure, the which free end is located outboard of the hydrocarbon structure at a distance from deck level, 40
 - maintaining the support frame (3) substantially stationary, 45

- connecting a connector end of the connecting duct section to the hydrocarbon vessel via a line,
- pulling the connector end of the duct section towards the hydrocarbon vessel via the line, and
- moving the displacement device downward towards deck level of the hydrocarbon structure from a substantially vertical disconnect position to a substantially horizontal connect position to become extended in a generally horizontal direction towards the hydrocarbon vessel.

9. Method according to claim 8, wherein the connecting duct section (8) is situated along the support frame (3), the displacement device (10) being situated at the free end of the support member, at a forward, lowered position whereafter the displacement device (10) is raised vertically upward towards a rearward position when the connecting duct section (8) is moved from its inclined position to be oriented vertically depending from the displacement device (10). 50

Patentansprüche

1. Kohlenwasserstoff-Überführungssystem, das eine Offshore-Struktur (1), ein Trageelement (3, 10), das sich von einer Decksebene (11) der Struktur nach oben erstreckt, und eine Kohlenwasserstoff-Überführungsleitung umfasst, die einen Überführungs-Leitungsabschnitt (27) umfasst, der sich von einem freien Ende (29) des Trageelementes (3) aus zu einer Kohlenwasserstoff-Lagerungs- und/oder Verarbeitungseinheit (28) an der Struktur erstreckt, wobei sich das freie Ende außerhalb der Struktur (1) befindet, und die einen Verbindungs-Leitungsabschnitt (8) umfasst, der in Fluidverbindung mit dem Überführungs-Leitungsabschnitt (27) steht und über ein erstes Ende (9) mit dem freien Ende des Trageelementes verbunden ist, wobei ein zweites Ende (12) des Verbindungs-Leitungsabschnitts (8) einen Verbinder (13) aufweist und an einem Kohlenwasserstoff-Schiff (4) angebracht werden kann, das Trageelement einen im Wesentlichen stationären Tragerahmen (3), der sich von der Struktur (1) nach außen erstreckt, und eine Verschiebungseinrichtung (10) umfasst, die mit dem ersten Ende (9) des Verbindungs-Leitungsabschnitts (8) verbunden ist, die Verschiebungseinrichtung zwischen einer Verbindungs- und einer Trennposition bewegt werden kann, und der Tragerahmen (3) dabei im Wesentlichen stationär bleibt, die Verschiebungseinrichtung (10) einen Arm umfasst, der über ein unteres Ende (36) gelenkig mit dem Tragerahmen (3) verbunden ist, ein Trageende (35) des Arms den Verbindungs-Leitungsabschnitt (8) trägt, ein Kraftelement (41) mit dem Arm verbunden ist, um den Arm zwischen einer Trennposition und einer im Wesentlichen horizontalen Verbindungsposition zu schwenken, ein horizon-

- taler Abstand von der Seite der Struktur für die Verbindungsposition (D1) größer ist als für die Trennposition (D2), **dadurch gekennzeichnet, dass** die Trennposition im Wesentlichen vertikal ist und ein vertikaler Abstand der Verschiebungseinrichtung zu der Decksebene (11) für die Trennposition (H4) größer ist als für die Verbindungsposition (H3).
2. Kohlenwasserstoff-Überführungsstruktur nach Anspruch 1, wobei sich das Trageelement (3) in einem Winkel (α) erstreckt, sich eine Tragefläche (25, 42) an wenigstens einem Teil der Länge des Trageelementes befindet und der Verbindungs-Leitungsabschnitt (8) auf die Tragefläche (25, 42) aufgelegt werden kann und sich so an dem Trageelement entlang erstreckt.
 3. Kohlenwasserstoff-Überführungssystem nach Anspruch 2, wobei sich die Verschiebungseinrichtung (10) in der Verbindungsposition befindet, wenn sich der Verbindungs-Leitungsabschnitt (8) auf der Tragefläche (25, 42) befindet.
 4. Kohlenwasserstoff-Überführungssystem nach einem der Ansprüche 1-3, wobei der Verbindungs-Leitungsabschnitt (8) einen flexiblen Schlauch umfasst.
 5. Kohlenwasserstoff-Überführungssystem nach einem der vorangehenden Ansprüche, wobei der Überführungs-Leitungsabschnitt (27) eine starre Leitung umfasst, die an dem freien Ende (29) des Tragerahmens (3) über einen Fluid-Rotationskopf (38), der um eine horizontale Achse herum gedreht werden kann, mit einer Verschiebungs-Leitung (30) verbunden ist, wobei ein zweites Ende der Verschiebungs-Leitung über einen zweiten Rotationskopf (39), der um eine horizontale Achse herum gedreht werden kann, mit dem Verbindungs-Leitungsabschnitt (8) verbunden ist.
 6. Kohlenwasserstoff-Überführungssystem nach Anspruch 5, wobei die Verschiebungs-Leitung (30) eine starre Leitung ist.
 7. Kohlenwasserstoff-Überführungssystem nach einem der vorangehenden Ansprüche, wobei die Überführungsstruktur ein schwimmendes Kohlenwasserstoff-Schiff umfasst, sich das Trageelement (3) an einem Heck (2) des Schiffs befindet und ein zweites Kohlenwasserstoff-Schiff (4) an seinem Bug (5) über wenigstens eine Festmachleine mit dem Heck (2) des Kohlenwasserstoff-Schiffs verbunden ist.
 8. Verfahren zum Überführen von Kohlenwasserstoffen von einer Kohlenwasserstoff-Struktur zu einem Kohlenwasserstoff-Schiff, das die folgenden Schritte umfasst:
 - Festmachen des Kohlenwasserstoff-Schiffs in der Nähe der Kohlenwasserstoff-Struktur,
 - Tragen eines Verbindungs-Leitungsabschnitts in einer im Allgemeinen vertikalen Ausrichtung über eine Verschiebungseinrichtung (10) am freien Ende eines im Wesentlichen stationären Tragerahmens (3) an der ersten Kohlenwasserstoff-Struktur, wobei sich das freie Ende außerhalb der Kohlenwasserstoff-Struktur in einem Abstand zu der Decksebene befindet,
 - Halten des Tragerahmens (3) an einer im Wesentlichen stationären Position,
 - Verbinden eines Verbindendes des Verbindungs-Leitungsabschnitts mit dem Kohlenwasserstoff-Schiff über eine Leine,
 - Ziehen des Verbindendes des Leitungsabschnitts über die Leine in Richtung des Kohlenwasserstoff-Schiffes, und
 - Bewegen der Verschiebungseinrichtung nach unten in Richtung der Decksebene der Kohlenwasserstoff-Struktur von einer im Wesentlichen vertikalen Trennposition an eine im Wesentlichen horizontale Verbindungsposition, so dass sie in einer im Wesentlichen horizontalen Richtung auf das Kohlenwasserstoff-Schiff zu ausgefahren wird.
 9. Verfahren nach Anspruch 8, wobei sich der Verbindungs-Leitungsabschnitt (8) an dem Tragerahmen (3) befindet, sich die Verschiebungseinrichtung (10) an einer vorderen abgesenkten Position am freien Ende des Trageelementes befindet und anschließend die Verschiebungseinrichtung (10) auf eine hintere Position zu vertikal nach oben angehoben wird, wenn der Verbindungs-Leitungsabschnitt (8) von seiner geneigten Position aus so bewegt wird, dass er von der Verschiebungseinrichtung (10) herabhängend vertikal ausgerichtet ist.

Revendications

1. Système de transfert d'hydrocarbures comprenant une structure offshore (1), un élément support (3, 10) s'étendant vers le haut à partir du niveau du pont (11) de la structure, un conduit de transfert d'hydrocarbures comprenant une section de conduit de transfert (27) s'étendant d'une extrémité libre (29) de l'élément support (3), laquelle extrémité libre est située à l'extérieur de la structure (1), à une unité de stockage et/ou de traitement d'hydrocarbures (28) située sur la structure, et une section de conduit de raccordement (8) en communication fluide avec la section de conduit de transfert (27) et reliée par une première extrémité (9) à l'extrémité libre de l'élément support, une seconde extrémité (12) de la section de conduit de raccordement (8) étant pourvue d'un connecteur (13) et apte à être fixée sur un navire

- transporteur d'hydrocarbures (4), l'élément support comprenant un châssis support (3) sensiblement fixe s'étendant à l'extérieur de la structure (1) et un dispositif de déplacement (10), relié à la première extrémité (9) de la section de conduit de raccordement (8), lequel dispositif de déplacement est déplaçable entre une position de connexion et une position de déconnexion tandis que le châssis support (3) reste sensiblement fixe, le dispositif de déplacement (10) comprenant un bras qui, par une extrémité de base (36), est relié de manière articulée au châssis support (3), une extrémité support (35) du bras portant la section de conduit de raccordement (8), un élément de transmission de force (41) étant relié au bras pour faire pivoter le bras entre une position de déconnexion et une position de connexion sensiblement horizontale, une distance horizontale depuis le côté de la structure étant plus grande pour la position de connexion (D1) que pour la position de déconnexion (D2), **caractérisé en ce que** la position de déconnexion est sensiblement verticale et **en ce qu'**une distance verticale du dispositif de déplacement depuis le niveau du pont (11) est plus grande pour la position de déconnexion (H4) que pour la position de connexion (H3).
2. Structure de transfert d'hydrocarbures selon la revendication 1, dans laquelle l'élément support (3) s'étend en formant un angle (α), une surface de support (25, 42) étant située sur au moins une partie de la longueur de l'élément support, la section de conduit de raccordement (8) pouvant être placée sur la surface de support (25, 42) pour s'étendre le long de l'élément support.
 3. Système de transfert d'hydrocarbures selon la revendication 2, dans lequel le dispositif de déplacement (10) est dans la position de connexion lorsque la section de conduit de raccordement (8) est située sur la surface de support (25, 42).
 4. Système de transfert d'hydrocarbures selon l'une quelconque des revendications 1 à 3, la section de conduit de raccordement (8) comprenant une conduite flexible.
 5. Système de transfert d'hydrocarbures selon l'une quelconque des revendications précédentes, dans lequel la section de conduit de transfert (27) comprend un conduit rigide qui est fixé, à l'extrémité libre (29) du châssis support (3), à un conduit de déplacement (30) via une tête de rotation de fluide (38) apte à tourner autour d'un axe horizontal, une seconde extrémité du conduit de déplacement étant reliée à la section de conduit de raccordement (8) via une seconde tête de rotation (39) apte à tourner autour d'un axe horizontal.
 6. Système de transfert d'hydrocarbures selon la revendication 5, dans lequel le conduit de déplacement (30) est un conduit rigide.
 7. Système de transfert d'hydrocarbures selon l'une quelconque des revendications précédentes, la structure de transfert comprenant un navire flottant de transfert d'hydrocarbures, l'élément support (3) étant situé au niveau d'une poupe (2) du navire, un second navire transporteur d'hydrocarbures (4) étant relié par sa proue (5) à la poupe (2) du navire de transfert d'hydrocarbures via au moins une ligne d'amarrage.
 8. Procédé de transfert d'hydrocarbures d'une structure de transfert d'hydrocarbures vers un navire transporteur d'hydrocarbures, comprenant les étapes suivantes :
 - amarrer le navire transporteur d'hydrocarbures dans le voisinage de la structure de transfert d'hydrocarbures,
 - soutenir une section de conduit de raccordement dans une orientation généralement verticale à partir d'un dispositif de déplacement (10) à l'extrémité libre d'un châssis support (3) sensiblement fixe sur la première structure de transfert d'hydrocarbures, laquelle extrémité libre est située à l'extérieur de la structure de transfert d'hydrocarbures à distance du niveau du pont,
 - maintenir le châssis support (3) sensiblement fixe,
 - raccorder une extrémité de connecteur de la section de conduit de raccordement au navire transporteur d'hydrocarbures via un câble,
 - tirer l'extrémité de connecteur de la section de conduit vers le navire transporteur d'hydrocarbures via le câble, et
 - abaisser le dispositif de déplacement en direction du niveau du pont de la structure de transfert d'hydrocarbures depuis une position de déconnexion sensiblement verticale à une position de connexion sensiblement horizontale dans une direction généralement horizontale vers le navire transporteur d'hydrocarbures.
 9. Procédé selon la revendication 8, dans lequel la section de conduit de raccordement (8) est située le long du châssis support (3), le dispositif de déplacement (10) étant situé à l'extrémité libre de l'élément support, à une position abaissée vers l'avant, après quoi le dispositif de déplacement (10) est relevé verticalement vers le haut vers une position arrière lorsque la section de conduit de raccordement (8) est déplacée depuis sa position inclinée pour être orientée verticalement de manière dépendante du dispositif de déplacement (10).

Fig 1

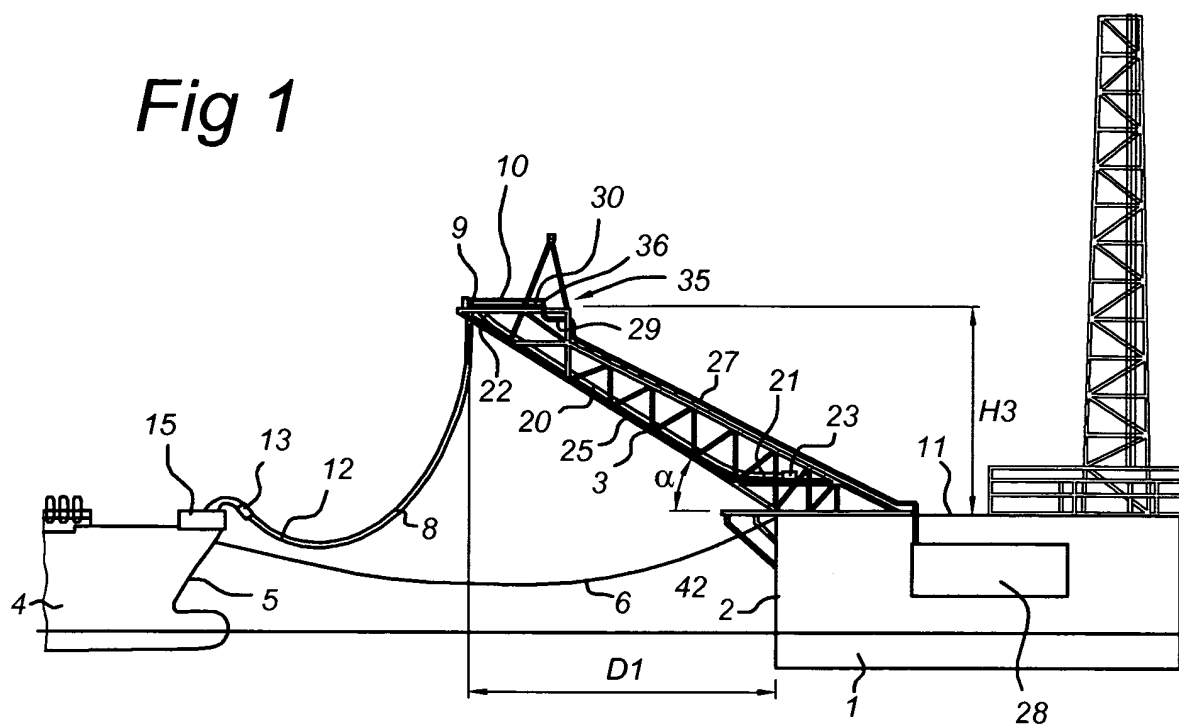


Fig 2a

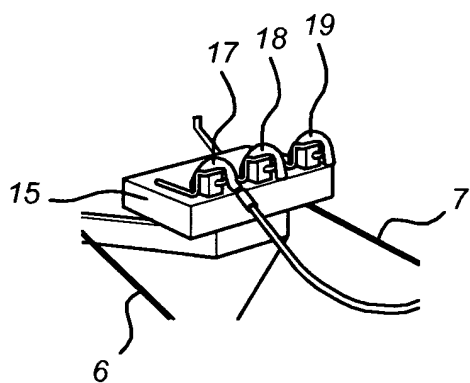


Fig 2b

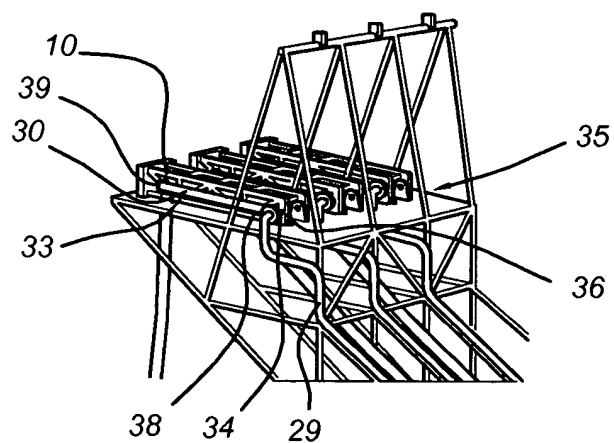


Fig 3

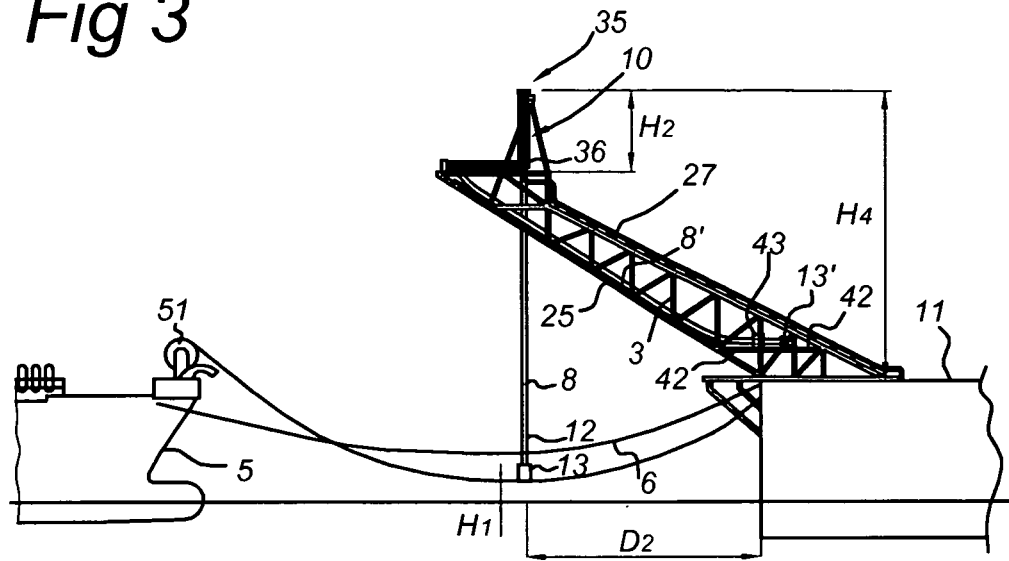


Fig 4

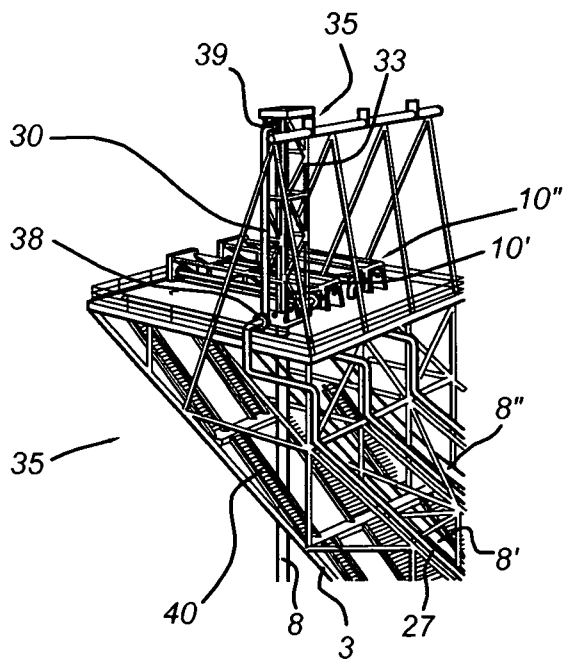


Fig 5a

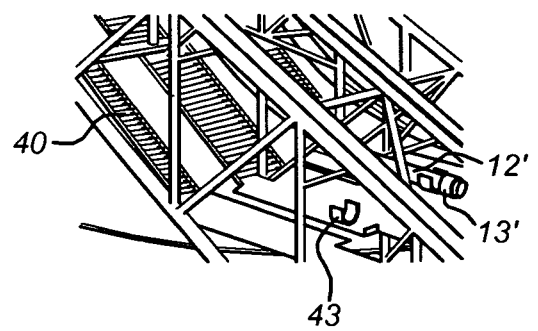


Fig 5b

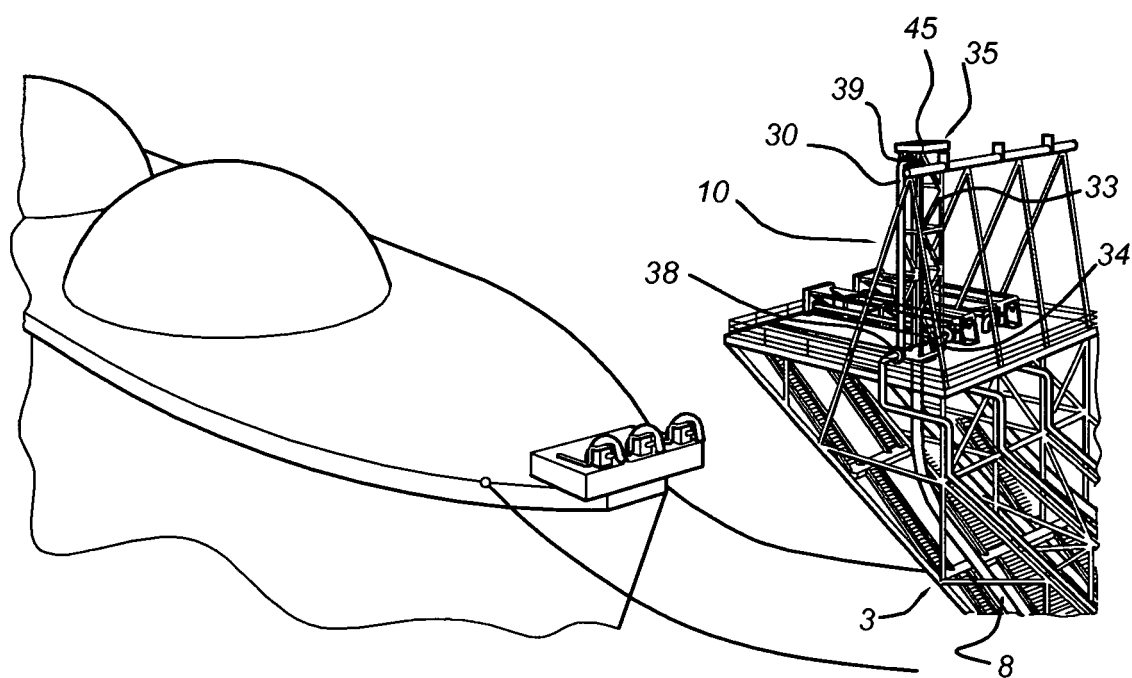


Fig 6

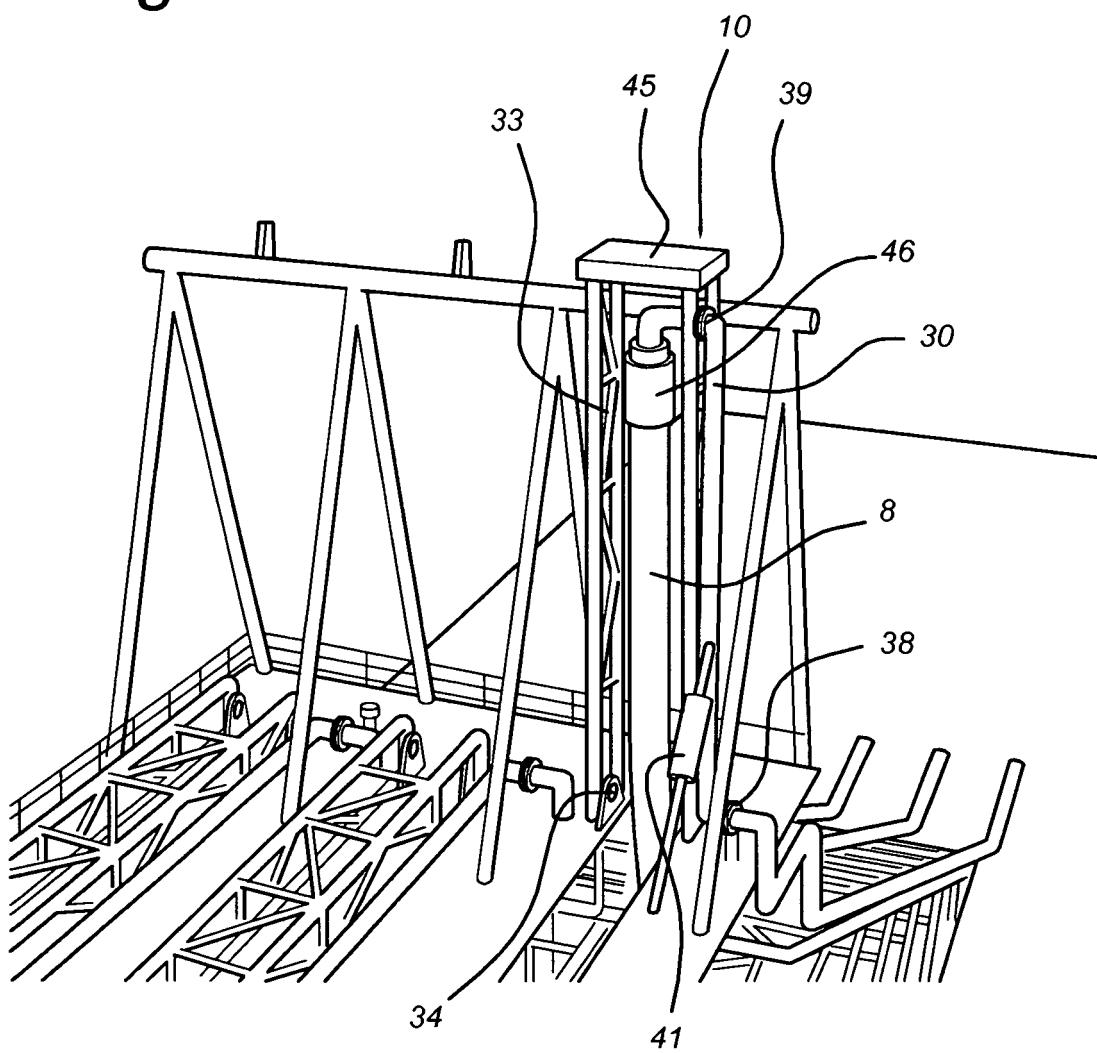


Fig 7

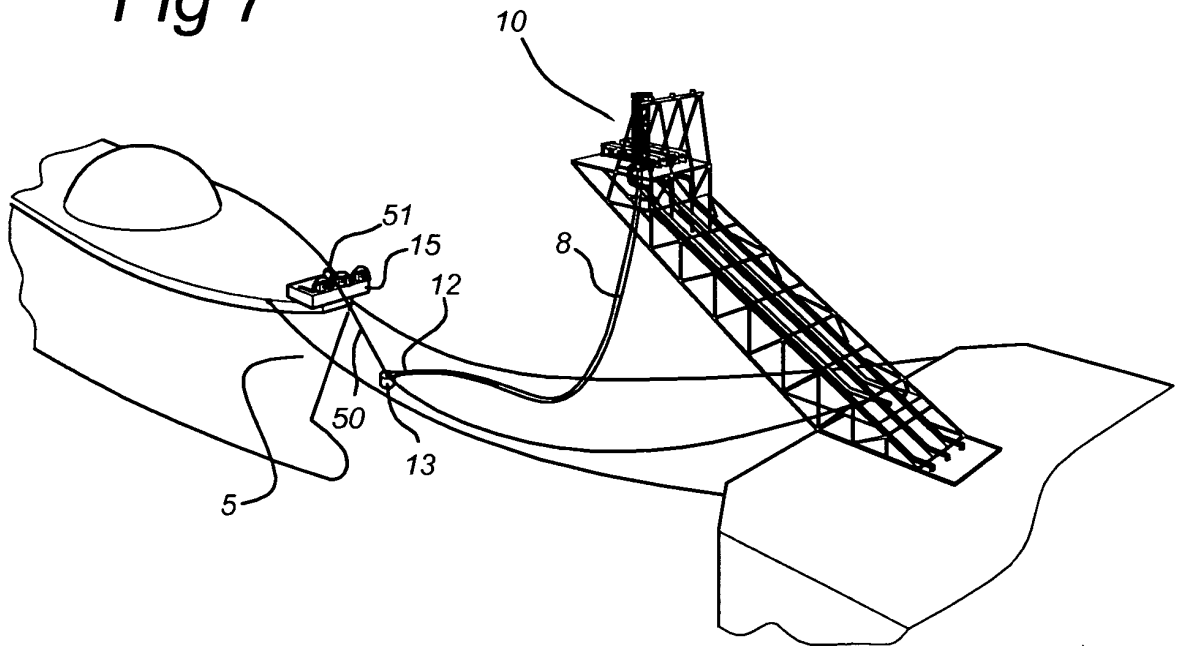
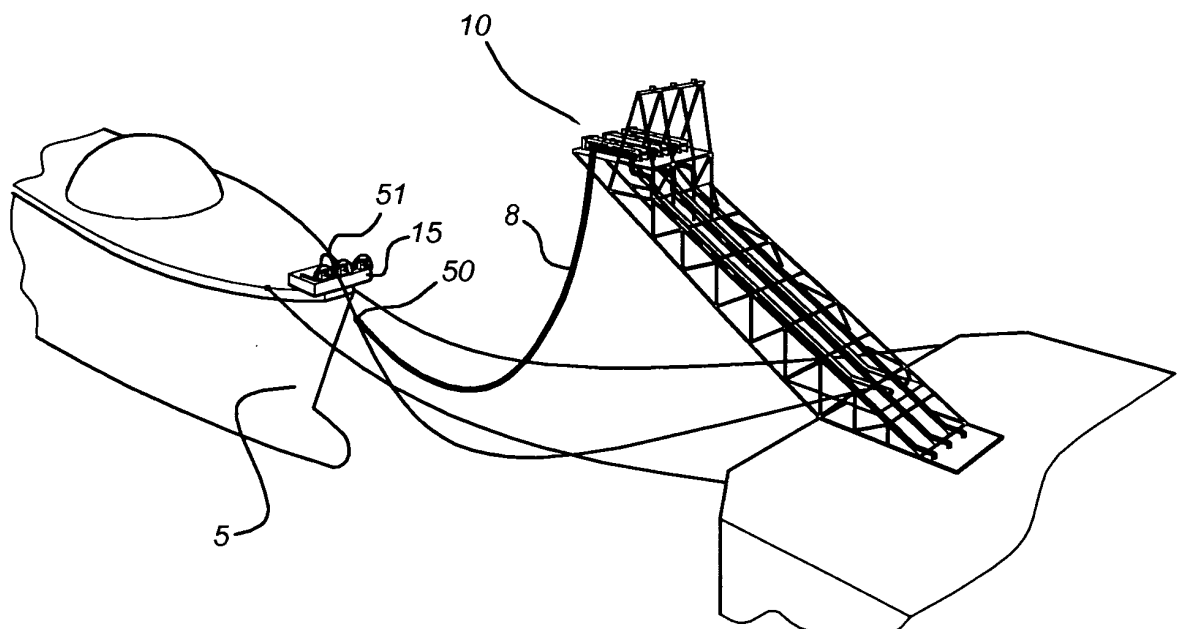


Fig 8



REFERENCES CITED IN THE DESCRIPTION

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Patent documents cited in the description

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